

Index Construction Issues for Exchange-Traded Funds

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Exchange-traded funds (ETFs) can be thought of as a hybrid between traditional closed-end and open-end mutual funds. Like closed-end funds, ETFs trade during the day on a securities exchange. Unlike closed-end funds, however, ETFs rarely trade at significant differences from their underlying net asset value (NAV). In this, they resemble open-end funds that trade once daily at NAV.

This combination of attributes is possible because assets enter an ETF portfolio only by in-kind contribution, and leave only by in-kind redemption. ETFs disclose their portfolios every day by posting an updated “creation basket.” Dealers who wish to create ETF shares make an in-kind exchange of this basket for a fixed number of ETF shares (typically 50,000).¹ Because of this creation and redemption process, one of the signal distinctions of exchange-traded funds is the transparency of a fund’s holdings.

Needless to say, such transparency is anathema to most active managers, who rightly prefer that their portfolio positions (and, more importantly, the changes in their portfolio positions) remain confidential. Current mutual fund disclosure requirements are well-suited to actively-managed portfolios.² The combination of ETF transparency with active managers’ preference for opacity means that *all current exchange-traded funds are index funds*.

Introduction

Although a number of ideas for structuring actively-managed ETFs have been advanced³, the current state of product design and regulation does not accommodate an easy resolution of the conflict between ETFs’ transparency and the typical active manager’s desire for secrecy. Consequently, ETF performance differences are, and for the immediately-foreseeable future will continue to be, largely index-driven. This paper aims to help potential investors in ETFs understand some of the issues that surround the index construction process. Although these issues are also relevant to potential buyers of open-end index mutual funds, they are uniquely important to investors in exchange-traded funds.⁴

Indexing in Theory

The theoretical case for passive investing is well-established and requires little elaboration here. Since the “market portfolio” comprises the sum of all managers’ holdings, the average active manager can be expected to match the market’s performance before costs, and to lag the market after costs. The argument does not rely on assumptions of active managers’ venality or

indolence. It is simply a function of what William Sharpe called “the arithmetic of active management.”⁵

This discussion raises an obvious question about the nature of the portfolio which the average active manager is expected to underperform. The “market portfolio” of theory is simply the weighted sum of all stocks outstanding. But weighted how? The traditional answer has been to weight by total market capitalization (i.e., by price times shares outstanding), but this ignores the fact that not all shares outstanding are available for purchase by investors. Corporate cross-holdings and private control blocks (e.g., Bill Gates’ shares of Microsoft or the Walton family’s holdings in Wal-Mart) are examples of such “unavailable” shares, as are government holdings of privatized former state monopolies. (For example, the German government owns approximately 40 percent of Deutsche Telekom.) Index compilers refer to the available capitalization – i.e., the value of the total shares outstanding less such private, corporate, and governmental control blocks – as a company’s *float*.

The owners of various control blocks are not investment managers whose performance is being compared to the market, and so logically their holdings should not count as part of the “market portfolio.” Otherwise stated, the market portfolio should be thought of as everything that managers can buy, and nothing that they can’t buy. It is therefore both *comprehensive*, since it contains every stock available for purchase, and *float-weighted*, since it weights each stock by its available capitalization.

In practice, however, *none* of the popular indices which underlie today’s ETFs are *both* comprehensive and float-weighted; in fact most of them are *neither* comprehensive *nor* float-weighted. This gap between theory and practice means that the presumption of superior performance to which the market portfolio is entitled does not extend to every extant index or index ETF. While it may be impossible for the average active manager in the U.S. to outperform the U.S. market portfolio, there is no theoretical reason why the average active manager can’t outperform a popular benchmark index such as the S&P 500.⁶ A potential investor in index ETFs will be well-served by understanding the ways in which real world indices differ.

Indexing in Practice

Indices are designed for a number of different purposes. The use of stock indices as market indicators predated the idea of a theoretical “market portfolio” by decades.⁷ Popular indices are often called “benchmark” indices because one of their main uses is to serve as a standard against which to compare the performance of active managers. There are a variety of benchmark indices available, many with currently-traded ETFs. Understanding the nature of these indices – and understanding the differences among ETFs based on them – requires understanding the answer to five questions:

- Is the index *comprehensive* or *sampled*?
- Is the inclusion mechanism *rules-based* or *discretionary*?
- How is the index *weighted*?
- Are inclusion and weighting decisions *consistent* over time?
- Can the index be *sensibly subdivided* – e.g., into industrial sectors, or growth and value components?

Comprehensive or Sampled

In practice, there are no *truly* comprehensive indices available, if comprehensive means that every stock, no matter how small, is included. In the U.S., the Wilshire 5000 (which actually contains some 5700 companies) is as comprehensive as they come; internationally, that accolade goes to the Citigroup Broad Market Index.⁸ A great many popular indices make no pretense of being comprehensive – witness the Dow 30 or the S&P 500 in the U.S. or MSCI EAFE internationally. Indeed, the utility of many indices springs from their ability to describe a subset of the market, not all of it. Even within identifiable subsets of the entire market, some indices have greater coverage than others. For example, the Dow 30, the S&P 500, and the Russell 1000 are all indices of large-cap U.S. stocks, listed in order of increasing comprehensiveness.

Rules-Based or Discretionary

If no index is fully comprehensive, not even within a defined market segment, it follows that index compilers must somehow choose which companies to include and which to exclude. Different compilers select index components in different ways. Inclusion decisions can be classified as either rules-based or discretionary. For example, the Russell 1000 is rules-based – its members are the 1000 largest companies in the U.S. (as of its June 30th annual reconstitution date). The S&P 500, which includes many of the same companies, is discretionary – its membership is whatever the S&P Index Committee chooses to make it.

Weighting

There are almost as many index weighting schemes as there are index compilers. As an outlier, the Dow Jones Industrial Average is price-weighted – a \$50 stock is twice as important as a \$25 stock (regardless of the number of shares outstanding). This made sense when the Dow was introduced, more than 100 years ago in an era of manual computation. Adding up a list of share prices and dividing by 30 (or an adjusted divisor) is substantially easier and faster than multiplying each price by shares outstanding, especially prior to the invention of the electronic calculator.

Capitalization weighting became widespread when technology permitted it, although only the S&P 500 (and its mid- and small-cap cousins, the S&P 400 and 600) retain pure cap-weighting today. Float weighting, introduced by Salomon Brothers in 1989, has become the gold standard for most index compilers, although no two index compilers handle float adjustments identically. Imagine a company for which 58 percent of the capitalization is held in private and corporate control blocks, so that 42 percent is available free float. There is arguably some imprecision in the measurement of the 58 percent (and hence of the 42 percent). Some index compilers (Citigroup, the successor to the Salomon Brothers index system, and Frank Russell) use their best estimate of the float – 42 percent in our example. MSCI and FTSE handle these ambiguities by adjusting within float *bands*, always rounding up – so the 42 becomes 45 (for MSCI) or 50 (for FTSE).⁹

Consistency

Not all float-adjusted indices were always float-adjusted. For example, MSCI EAFE converted to banded float-weighting only in 2001. Pre-2001 MSCI numbers are cap-weighted. (The same is true of FTSE, with a different conversion schedule.) Pre-conversion numbers were *not*

adjusted retroactively in either case. Index users should therefore be aware that historical analysis of MSCI or FTSE data requires use of a time series which is partially cap-weighted and partially float-adjusted.

Subdivisions

Almost all index systems contain a number of subindices or subdivisions, the most common of which are based on size (i.e., capitalization), sector, and style. In index families, as in real families, the children often look like the parents. If the parent index is committee-selected, the sub-indices are committee-selected; if the parent is float-weighted, the children are float-weighted; if the parent used to be cap-weighted, so too did the children. If we compare two index families, however, the differences among “second generation” indices will often be much greater than those among “first generation” indices. In other words, if we ask two competing index compilers what the overall U.S. market did last year, the answers will be closer than if we ask how the large-cap growth stock segment did. This is because each index family subdivides itself by capitalization, sector, and style in different ways.

For example, consider the comparatively uncontroversial issue of size- or capitalization-specific indices. The Russell indices use rules to define small- and large-cap indices. (Specifically, the Russell 1000 comprises the largest 1000 companies in the U.S., as of each June 30th, and the Russell 2000 comprises the next largest 2000 companies.) The S&P indices, which as noted above are committee-determined, are committee-determined throughout the capitalization spectrum. The constituents of the large-cap S&P 500, mid-cap S&P 400, and small-cap S&P 600 are all selected by the same committee.

Sector or industry indices are common to all index families, but not all sector classifications are identical. MSCI and S&P have combined to create a “Global Industry Classification Structure.” In competition with GICS, other index compilers retain their own methodologies. In addition, a number of ETFs are based on specially-developed industry indices.

Compared to capitalization or sector, style (i.e., growth and value) is not as susceptible to easy definition. After all, no one would dispute that Microsoft is a large company, and no one would dispute that it belongs in the technology sector. But is it a growth stock? Definitions of growth and value vary, and these differences are reflected in the performance of ETFs based on the style indices of various providers. Distinguishing among competing style indices requires us to answer a number of additional questions:

- Are growth and value *categories* or *quantities*? Some providers (notably S&P/Barra, which originated style indices in 1992) treat growth as a category – a company either has it, or it doesn’t. Growth-value is a binary function, not a continuum. Most other providers treat growth as a quantity – a company can have more of it or less of it.
- What determines or measures growth and value? The S&P/Barra answer is the price to book value ratio. Other providers use more complex, multivariable formulae.
- Are companies divisible? Some index providers will assign 100 percent of a company’s capitalization to either the growth or value index.¹⁰ Others will divide a company’s capitalization between the two – so that 60 percent of a firm’s capitalization might be in the growth index, and 40 percent in value.

Implicit Costs in Benchmark Indices

Although no benchmark index matches the “market portfolio” of modern portfolio theory, in the early days of indexing the distinction was of more academic than practical interest. The absolute dollars under passive management were small, and early index funds tended to focus on large-cap stocks where transaction costs are generally lower. As indexing has grown, however, the implicit cost of investing in benchmark indices has grown.

We can illustrate this point by referring to a recent rebalancing of the S&P 500 index. In July 2002, the S&P index committee announced that it would drop from the S&P 500 seven companies domiciled outside the U.S. In the nine trading days between the announcement of the change and its effective date, the seven newcomers appreciated by approximately 7 percent, while the deletions fell by roughly 22 percent. The stocks involved represented roughly 2 percent of the index’s market value.¹¹ A performance gap of 29 percent on 2 percent of market value implies an embedded cost of 58 basis points (0.58 percent) for the index, just from one rebalancing.

Embedded transactions costs are not unique to this rebalancing of the S&P 500 – they occur in other indexes and other time periods as well.¹² Interestingly, the costs are not self-evident. If one observes only the returns of the index itself, the effect will be invisible. An analyst needs to examine the dynamics of index additions and deletions to appreciate the magnitude of these costs.

The embedded transaction cost problem stems from a common characteristic of all benchmark indices. We noted above that different indices are designed to serve different purposes, and that benchmark indices were originally designed to serve as standards against which investments and investment managers could be evaluated. Importantly, therefore, changes to a benchmark index must be disclosed *before they become effective*. Otherwise a manager is being judged against an unknown, or at least an opaque, standard.

Besides benchmarking active managers, for what other purposes might indices be designed? One obvious purpose is to serve as a fund template – i.e., as a model portfolio to guide the investment of real money. What characteristics would be desirable for such an index? One obvious one, given the foregoing discussion, would be that it not disclose index changes – i.e., the fund’s trading plans – in advance of the fund’s trade executions.

Such a “silent” index would be *designed* to serve *solely* as a fund template. Silent indices could cover the same market segments and sub-segments as benchmark indices do currently. Unlike benchmark indices, however, changes to a silent index would only be disclosed publicly *after* the manager of a silent index fund has had the opportunity to incorporate the change into the silent index fund portfolio. The controlling principle of a silent index fund is that *no one other than the fund manager needs to know in advance what an index change will be and when it will occur*.

Silent Indices and Future ETF Development

The development of silent index funds could be a powerful spur to the growth of the ETF market generally. The most popular benchmark indices are by now all “taken” – i.e., ETFs based on them have already been developed and marketed, in a few cases by more than one fund issuer. Continuing growth in the exchange-traded fund market requires more than simply lining up new benchmark indices.

How would an ETF based on a silent index differ from today’s benchmark index ETFs? From a regulatory standpoint, three changes in current Securities and Exchange Commission policy would be desirable, if not absolutely essential. First, the SEC currently requires separation in the roles of ETF manager and index compiler. This is not an onerous requirement for current benchmark ETFs, but is unnecessary for a silent index structure. Obviously, a silent index fund cannot be based on any commercially-available index. No one will know when changes in a silent index have been made until after they’ve been implemented in a silent index portfolio. Requiring the participation of a third-party index compiler in this process adds needless expense without any compensating benefit. Combining the roles of fund manager and index compiler will make it easier for the manager to define index membership rules and rebalancing schedules with enough specificity that investors will understand what they’re buying, but enough ambiguity that opportunistic traders will be unable to front run the fund.

The second desirable regulatory change relates to the time at which dealers must notify an ETF of their intent to create or redeem fund shares. For all current ETFs, this deadline is 4:00 PM Eastern time (i.e., normal market close). This means that whenever an ETF manager changes his portfolio, he cannot be assured of buying and selling the right quantity of stock. For example, if there are net creations on the day of a change, the manager will have sold too little of the stock being dropped from the portfolio, and will have to clean up the residual the next day.

This is a potential problem because one can easily discern when an ETF’s portfolio has changed by comparing the ETF’s creation baskets on successive days. Suppose that, overnight, stock X had disappeared from an ETF’s creation basket and stock Y had taken its place; suppose further that the ETF in question had experienced net creations on the prior day. Then opportunistic traders will realize that the ETF has to sell X and buy Y, and they will attempt to trade ahead of the ETF, potentially increasing its transactions costs.

The actual, as opposed to the potential, transactions cost impact of this scenario will depend in part on the degree to which the shift from X to Y is a surprise. Since current ETF managers track benchmark indices and tend to trade only on days when index changes become effective, shifts from X (a stock being dropped from the index) to Y (its replacement) are old news by the time the trade takes place.

Not so with a silent index fund, where the whole point is that index changes not be known until the portfolio’s trading is complete. By requiring an hour’s additional notice of intentions to create or redeem, the SIF can execute all trades required by index changes *in a single day*.¹³ By the time publication of the next day’s creation basket makes it obvious that the index has changed, the change will have been completely implemented in the fund.

The third desirable regulatory change would enable ETFs to offer multiple share classes, as conventional mutual funds do currently. This would, for example, let a fund manager create an institutional share class with lower management fees. Such a share class could be critical in gaining acceptance of silent index funds.

The cost of revealing trading plans for benchmark index funds is obvious, even if it is hard to measure precisely. Thus, it is easy to make the case that well-designed silent indices should outperform current benchmark indices covering the same market segments. This argument should resonate particularly with large institutional investors, whose commitments to benchmark index funds amount to billions of dollars. The amounts involved make the absolute dollar value of embedded transactions costs significant, and many such institutions have access to the expertise required to evaluate the benefits of a silent index.

This institutional demand would very probably serve as the seed capital for the first silent index vehicles. Retail investors will benefit from the concept, and have demonstrated their demand for passive funds, but they are less attuned than institutions to the embedded cost problem and hence are less likely to serve as the initial capital providers for the silent index concept. Retail demand will likely follow the implicit endorsement of institutional shareholders, who presumably will have done appropriate due diligence on the fund's structure and indexing process.

Institutionalizing the ETF Market?

A silent index fund does not have to be exchange-traded, of course, but a multi-share class ETF is a natural way to accomplish a pooling of institutional and individual investors so that each can have the combination of cost and service to which they are accustomed. Such a vehicle would also preserve the tax and trading advantages that ETFs offer relative to most conventional fund structures.¹⁴

Beyond the regulatory issues, there are the obvious problems confronting the introduction of any new financial product. Inertia is a powerful force, and established benchmark index fund managers have a vested interest in defending the status quo. Their installed base of benchmark index clients is huge, and embedded transactions costs make it possible to outperform benchmark indices in a way unlikely to be duplicated in the silent index world.¹⁵

Institutions have typically shown little interest in the current set of exchange-traded benchmark index products.¹⁶ In part, this is because the current creation and redemption process encourages ETF managers to trade only at market close on the day a benchmark index changes, so that ETFs tend not to outperform the indices on which they are based. Institutions can typically obtain greater trading flexibility and better performance in either a separate account or a different form of commingled fund. A silent index, by avoiding the embedded transactions costs of the benchmarks, offers the possibility of improved performance. An ETF institutional share class should make it possible for an institution to enjoy that possibility at reasonable cost.

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ENDNOTES

¹ Similarly, dealers who wish to redeem ETF shares deliver 50,000 ETF shares to the fund custodian and receive a basket of securities in exchange. Except in unusual circumstances, this “redemption basket” is indistinguishable from the creation basket referred to in the text. See Gastineau (2002d).

² A change proposed by the Securities and Exchange Commission calls for quarterly disclosure of fund portfolios with the same 60-day lag required in the current semi-annual disclosure.

³ See, e.g. Gastineau (2002a).

⁴ Although our discussion focuses on equity indices, there are also a number of fixed-income ETFs.

⁵ Sharpe (1991).

⁶ For example, if small-cap stocks outperform large caps over a sustained period, and most active managers have a small-cap bias relative to the S&P 500, the average manager might well outperform the S&P 500. (Whether the S&P 500 is an appropriate benchmark for managers who persistently have a smaller-cap bias is another issue.) See Pane and Dash (2003) for an update of recent performance data, which are not encouraging for the active management faction.

⁷ See Nadbielny (1994), pp. 8-10.

⁸ See <http://www.wilshire.com> and www.equityindex.citigroup.com/.

⁹ See www.msci.com/methodology/index.html and www.ftse.com/indices_marketdata/index_rules.jsp

¹⁰ Obviously, if the provider’s view is that growth and value are categories rather than quantities, this is automatic. But even if growth and value are considered quantities, it’s still possible to assign a company to only one index.

¹¹ See www.forbes.com/2002/07/10/0710sp.html. Data on performance of additions and deletions from Citigroup Global Equity Index Group.

¹² See Nadbielny (2001), pp. 9-10.

¹³ This feature also can improve a benchmark index ETF manager’s ability to implement index changes away from the official date and time of the index change. The manager who seeks to beat the benchmark by changing the implementation time or date of an index change is simply capturing some of the transaction costs embedded in the benchmark index.

¹⁴ See Gastineau and Lazzara (2003).

¹⁵ See Blume and Edelen (2002).

¹⁶ One sometimes hears of legendary institutional ETF purchases or holdings. Securities firms, hedge funds, and a few institutions hold and, more importantly, trade ETFs like the S&P 500 SPDR and the NASDAQ 100 QQQs for risk management purposes. A review of 13-F filings reveals that institutional holdings of ETFs are half or less of the percentage holdings in most common stocks and many of these holdings are for risk management purposes or in managed ETF accounts.